Improving process performance through market network design

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Improving Process Performance through Market Network ReDesign: A Study of the Impact of Electronic Markets in the Financial Securities Sector

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Abstract

Previous research suggested that the performance of inter-organisational processes can be influenced by eight factors: stakeholders, competition, information technology, market network design, perceived risk, process design, information, and trust. This paper specifically focuses on the consequences of market network redesign for inter-organisational processes. A distinction is made between transaction oriented electronic markets and processing oriented electronic markets. Case studies in the financial securities industry show that an open market structure with many participants can be successful for complex transaction processes. Support of at least several stakeholders is crucial for the success of an electronic market.

Keywords: electronic markets, financial industry, case study, inter-organisational systems

1. Introduction

The financial securities sector has changed in many ways over the last decade. First, the numbers and volumes of transactions in financial securities (stocks, bonds and derivatives) have grown tremendously over the last few years, currently well over 25,000 billion US$ in the USA alone [1]. Second, stakeholder interests of various financial institutions have changed because of increased competition, the developments of Information Technology and developments towards electronic markets. Third, globalisation of the industry and increased competition has lead to consolidation and diversification in the industry, differentiation in services offered, and increased importance of risk management. Fourth, developments in Information Technology create opportunities for organisations to communicate electronically, thus improving the speed and quality of information exchange and enabling and supporting the globalisation of the industry.

The changes in the financial industry did not automatically lead to globalisation of the markets. For instance, organisations in the USA like E-trade, Suretrade and Ameritrade offer prices for trade execution through Internet that are around 16 US$ for a round trip (buying and selling with a maximum of 10,000 USD per trade). Trading through full service brokers is more expensive, costing around 1% of the total trade price (no limits to transaction size). Exporting these Internet services to countries outside the USA is hampered by infrastructural differences. For instance, price competition in the USA relies heavily on the transaction settlement and clearing services of the Depository Trust Company (DTC). Similar services are not available in European countries, due to for instance the fragmented markets and different languages and currencies.

Another aspect of globalisation is the reduction of the time needed to process an inter-organisational securities transaction, which has consequences for the competitive position of organisations as well as the risk perception of different stakeholders [2]. The question now rises how inter-organisational processes can be (re)designed, taken into account internal control measures that might lengthen the processing time and might jeopardise the competitive position or globalisation aspirations of stakeholders.

The goal in this paper is to identify relations between market network design and the performance of inter-organisational securities transaction processes. Process

performance is determined by logistic factors such as throughput time, reliability of throughput time and security, but also by other characteristics such as costs, price, volume, transparency and flexibility [3]. The inter-organisational market network design sets the rules, regulations, and space to manoeuvre for each stakeholder and is closely related to the design of intra-organisational processes and co-ordination [8,9]. The focus of this paper is on the effects of market network design structures on inter- and intra- organisational process (re)design efforts.

The case study method was used because it enables 'reality' to be captured in considerable greater detail than other methods and also allows the analysis of a considerable greater number of variables [11,12]. Two of the three case studies in this paper have been derived from the literature, the third case study is based on extensive research in Robeco Group, a large asset management organisation in Europe.

This paper is structured as follows. Theory on business process redesign and electronic markets is presented in section 2. Based on the theory, a 2x2 matrix is used to identify four forms of electronic markets in section 3. Section 4 summarises the research framework. In section 5 three cases in the financial securities industry are analysed with respect to the performance and the design of electronic markets. In sections 6 and 7 the cases are discussed and conclusions are drawn.

2. Business process redesign and Electronic Markets theory

2.1. Levels of Business Process Redesign

A well-known framework for analysis of the impact of IT on organisations is the model by Venkatraman [10]. In this model five levels of IT-induced business transformation are distinguished. Venkatraman identifies the first two levels as evolutionary and the last three levels as revolutionary. The evolutionary levels take the existing situation as a point of reference and the revolutionary levels take the desired situation as a point of reference. The revolutionary levels require radical changes in business practices [10]. To achieve the benefits of revolutionary levels fundamental knowledge is required of the entire business network.

Clark & Stoddard [15] support the claim of Venkatraman that benefits will increase when IT is integrated with business processes. They propose a framework that focuses on the '...merging [of] technological and process innovations in order to achieve the potential to transform both organisations and inter-organisational processes and relationships'. Benjamin et al [16] argued that the benefits of Electronic Data Interchange, especially cost savings resulting from EDI projects, can only be realised when basic organisational structures and work processes are redesigned. Stoddard & Jarvenpaa [14] identified the need to assess risks and costs in deciding to either follow an evolutionary or revolutionary approach, as well as to review the possibilities embedded in the capabilities of the people in the organisations that are being confronted with these changes. Benjamin & Wigand [17] addressed the developments in value chain linkages based on IT and identified the bilateral links between buyers and suppliers by using EDI techniques. These database links and sharing databases between firms are described as electronic supply chain integration. This does not necessarily involve redesign of business processes.

2.2. Electronic Markets

Markets co-ordinate the flow of goods and services through supply and demand forces and external transactions between individuals and organisations. Hierarchies, on the other hand, co-ordinate the flow by controlling and directing it at a higher level in the managerial hierarchy [18]. IT affects both markets and hierarchies in the sense that more information can be communicated in the same or less amount of time and because the costs of communication decrease. Markets are believed to benefit more from IT than hierarchies because the unit costs of co-ordination is likely to decrease more because of IT [18].

Electronic markets might arise from either a non-electronic market or from an electronic hierarchy spanning organisational boundaries. However, it should be realised that different stakeholders have different interests in the development of electronic markets or hierarchies [19,20]. The success of an electronic market is depending on the shared interest of the different stakeholders involved. Malone has addressed the fact that the development path towards electronic hierarchies should be step by step, first by linking stand-alone databases and subsequently work towards shared databases.

Electronic hierarchies, contrary to electronic markets, are characterised by privileged access to market data and are formed by small groups of vertically arranged companies that develop very close relationships between themselves, forming a virtual hierarchy [21]. Clemons et al. examined the impact of IT on the organisation of production and presented the 'move to the middle' hypothesis, indicating a third market form 'networked organisations' [22].

A critical drawback of research related to electronic markets is the fact that markets are often defined and treated in abstract economic terms (i.e. markets co-ordinate economic activity through a price mechanism). In reality, different market structures exist, each organising

Table 1. Four forms of electronic markets and examples (see text for explanation of acronyms)

	Bilateral form	Multilateral form
Transaction Oriented Electronic Markets	TRADE SABRE Valuelink	CALM AUCNET Tele Flower Auction CATS Instinet Teleroute Optimark (case 1) Schwab (case 2)
Process Oriented Electronic Markets	Worldlink	Robeco (case 3) Tradenet IRAS

trading processes and related information processing activities in different ways [20]. Therefore research on electronic markets has moved into the description and analysis of cases. An example of the case study approach is the analysis by Lee and Clark [23] of the evolution of electronic market systems from a reengineering perspective that they call market process reengineering. Analysis of four case studies (CALM, AUCNET, Plants trading, CATS) focused on the pricing and trading aspect of electronic markets. They conclude that IT is a necessary factor but insufficient for reengineering to be successful. Next to management capabilities to overcome social and economic barriers, they identify aspects like standard product quality ratings and inspections, quick achievement of critical mass and preparation for resistance and retaliation as major critical success factors for the emergence of electronic markets.

Another example of the emergence of an electronic market system is Tradenet described by Teo, Tan and Wei [24]. The Trade Development Board in Singapore has set up the Tradenet electronic markets system to promote Singapore as a premier international trading hub. The Tradenet system is an electronic market system facilitating the administrative processes related to international trades [24]. By the end of 1992, Tradenet was linked to 30 public-sector organisations and 2200 organisations from the trading and banking communities. The authors conclude that Tradenet has enabled major process improvements, when measured in terms of the numbers of documents processed, staff involved, annual trade volume, annual trade inquiries and turnaround times.

3. Four forms of electronic markets: a model

The theories and cases in section 2 show that electronic markets can be found in various forms.. Some electronic markets focus on trading between buyers and sellers and provide information about the goods that are traded [23]. These electronic market types are sometimes called 'market making electronic marketplaces' [25]. Another type of electronic markets supports the transaction administration and settlement process (e.g., TRADENET). Other examples of electronic markets are the electronic market systems at the London Stock Exchange [27], the SABRE system by American Airlines [24], the ValueLink system at Baxter Healthcare [26], the TRADE system at Barclays de Zoete Wedd [22] and Optimark [27]. Holland et Al. [28] described a case study of inter-organisational information systems implemented at Motorola for the netting of global payments of Motorola enabled by and supported by the WorldLink payment system of Citibank. The situation at Motorola can be regarded as an electronic hierarchy rather than an electronic market.

In this paper we distinguish with Clemons and Row [29] and Benjamin et al [16] between transaction processing and process oriented markets. The primary characteristics of *Transaction Oriented Electronic Markets (TOEMs*) are that buyers and suppliers do not need to know each other (because of intermediaries) and the important elements are price and quantity related to the transaction. *Processing Oriented Electronic Markets (POEMs).* are characterised by direct and close relationships between organisations and that more elements are necessary in communication between the organisations.

With Bakos [25] we distinguish 'bilateral forms of integration' in situations where buyers and sellers already have established a relationship and 'multilateral situations' where the electronic market system is used to establish new buyer-seller relationships. Table 1 outlines four forms of electronic markets, in which the previously described examples are presented.

Van Heck and Ribbers analysed the influence of market network design on the success of electronic markets [19]. They conclude that in complex relationships closed structures with only a few participants will be most successful, whereas open structures (many participants) will be successful when the relationship is relatively simple. POEMs are believed to be more complex than transaction oriented electronic markets. Tele-Flower Auction (TFA) in the Netherlands is an example of a multilateral TOEM. Analysis of the implementation of TFA indicates that trust and the provision of high quality information are very important for being successful [20].

An example of a process oriented multilateral electronic hierarchy is the Inland Revenue Authority in Singapore (IRAS) after it had been redesigned [30]. The tax control processes were redesigned based on fundamental changes in the assumptions towards tax payers, from the belief that 80% of tax payers are fraudulent to the belief that 90% is OK. The paper-based system with manual controls was changed into an information-based system with exception reporting [30].

In this paper three cases in multilateral markets are analysed: two transaction oriented cases and one process oriented.

4. Research framework

Figure 3 shows the framework presented by Toppen et al. [2] giving four exogenous and four endogenous factors, which influence the performance of intra-, and inter-organisational processes related to financial securities transactions. The exogenous factors (Stakeholders, Competition, Information Technology and Market Network Design) have an impact on the organisations that operate in a business network. For instance, Schwartz [3] mentions market design characteristics that are applicable to securities markets (transaction oriented markets): competition, information flows, order types, order handling, rules of order execution, price improvement, use of electronic equipment, participant flexibility, price discovery mechanism and regulation.

The exogenous factors are beyond the scope of influence of an individual organisation, but affect the endogenous factors, that are within the scope of influence of an individual organisation. The four endogenous factors are Perceived Risks [35], Process Design and Co-ordination [36,37,38,39,42], Information [41,45] and Trust [43,44]. These factors influence the performance of inter-organisational processes.

Process performance can be related to intra-organisational as well as to inter-organisational processes, or to both. The level of scope for process performance is determined by the degree of business transformation, indicated in the Venkatraman model (section 2.1).

Process performance in TOEMs or POEMs can be measured in several ways. Schwarz [3] gives the following performance criteria for Transaction Oriented (Electronic) Markets: liquidity, transparency, accessibility, low transaction costs, accurate price discovery, and adequate information about product, recent transactions, and current prices. Toppen et al [2] give criteria POEMs: throughput time, reliability, quality, efficiency, costs, risks, controllability, flexibility, logistic performance.

The present paper focuses on three factors in the framework: 'stakeholders', 'market network design', 'process design', and the influence on 'process performance'. As a starting point for investigating the relations between these factors in case studies, two assumptions were formulated:

Assumption 1: *Convergent incentives for stakeholders have a positive effect on process performance and on the*

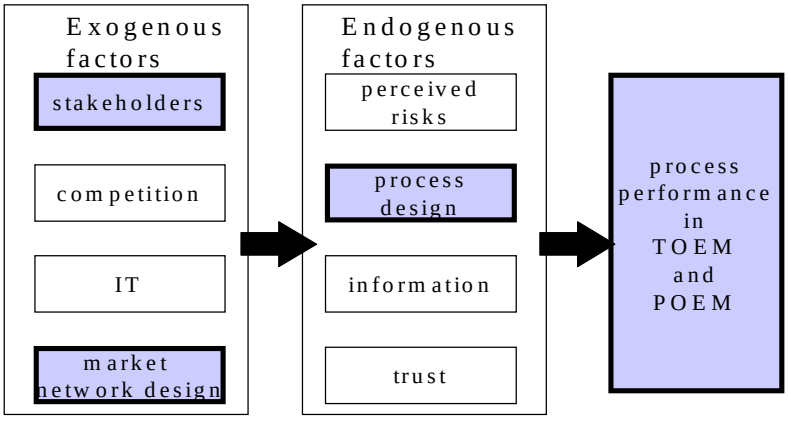

Figure 1. Framework of four exogenous and four endogenous factors influencing process performance [2]. The shaded factors are investigated in the cases in 4.2 to 4.4.

success of electronic markets.

Van Heck and Ribbers [19] argued that convergent incentives for stakeholders have a positive effect on the success of an electronic market as perceived by stakeholders. The positive effect on process performance results from lower perceived risks, a willingness to adapt process design, information sharing in the new electronic market, and trust.

Stakeholder incentives are more important in TOEMs than in POEMs, because stakeholders in POEMs have already established a longer-term relationship. This is in accordance with the conclusion of Lee and Clark [23] that 'the economic effects of electronic markets, reduced transaction costs and increased market efficiency', should be analysed together with 'adoption barriers such as transaction risks and lack of necessary market power to enforce the change'. Bakos [25] advocated that Emerging Electronic Markets drive profit margins away from suppliers, favouring customers and market making firms (in transaction oriented electronic markets). Therefore, it is argued that suppliers should co-ordinate and control the Electronic Market System to avoid losing power and profits.

Assumption 2: *Process performance in TOEMs is more dependent on achieving critical mass -in terms of number of participants and volumes- than in POEMs.*

Following the analysis of successful design aspects of electronic markets [19], it is expected that POEMS, being more complex than transaction electronic markets, will be more successful with a small number of participants. In this context Clemons et al. [22] argue that. 'IT reduces co-ordination costs, lowers operations risks and reduces opportunism risks, favouring increased outsourcing and/or increased explicit co-ordination which implies increased reliance on fewer, long term co-operative suppliers.'

In the next section three cases are described of electronic markets in the financial securities business. The first two cases relate to POEMs, the other one to TOEM. Each case consists of a description of the electronic market, an indication of the performance of the market, and requirements for the design of the market.

5. The financial securities sector

5.1. The Securities Transaction Process

Many organisations are stakeholders in the securities sector, such as investors, investment managers, brokers, exchanges, custodians, securities depositories, and regulatory organisations. Each stakeholder can be involved in the various phases of a securities transaction, i.e. execution, confirmation, settling and clearing of the transaction [2].

In the Securities Transaction Life Cycle (STLC) a transaction is seen as a series of nine phases [2, 13]. The STLC starts with the decision by the *investor* or *investment management organisation* to either buy or sell a specific security (phases 1 and 2). The order is given to a *broker* who executes the order (phase 3) on the *exchange* where the security is listed. Phase 4 is for matching the confirmation of the transaction details with the order, to check the execution of the deal, and to initiate the settlement of the transaction. When the transaction information matches, a matched trade report is provided (phase 5) to update portfolios. If securities are held at different locations it may be necessary to move them to a central place (phase 6). Before a transaction is settled, the delivery and payment of the securities are checked. A *(global) custodian* takes care of the settlement and clearing of the transaction based on the instructions it receives (phase 7). The payment will not be made unless, simultaneously, the corresponding securities are exchanged. It is also possible to separate the payment from the delivery, but this means taking the risk of non-payment or non-delivery. The last two phases of the STLC consist of various internal cash and securities management in each organisation involved.

The STLC can be separated in two major parts each having an inter-organisational dimension: one part focusing on the transaction and the second part focusing on the settlement and payment of the transaction. Although the two parts can be analysed separately, it must be realised that they are highly interdependent.

With respect to the transaction oriented and processing oriented electronic markets as described above, the first phases relate to the TOEMs and the latter phases to POEMs. In the next sections three cases are described: the first two cases (5.2, 5.3) relate to TOEMs, the third case (5.4) to POEM.

5.2 Institutional Trading: Case Optimark

The Optimark case is based on Clemons and Weber [27] who present an overview of the restructuring of Institutional Block Trading (the trading of large numbers of securities) using the OptiMark System. One important problem in institutional trading is *market liquidity*, i.e. the ability of a market to complete large trades without significant price impact or delays in order execution. Clemons and Weber indicated that the total institutional trading costs amount up to of 1,36% of the total trade value. The total costs consist of costs related to brokerage commission (0.13%), bid-ask spread and market impact (0.27%), timing costs (0.43%), and opportunity costs (0.53%). Considering the fact that an institutional investor plans to eventually sell the securities again, this means a total of nearly 3% costs, which will be deducted from the returns of the investment.

Clemons and Weber indicate that fund managers have seven alternatives for the trading of large quantities of securities:

Convey full order to the market; the investor will be confronted with all of the above mentioned costs.

Contact a dealer on a block-trading desk; the investor will get one bid or offering for the full quantity, the market price risk will be taken by the block-trading desk

Shop the order; the investor will use different brokers to get the entire trade executed, but he is still confronted with the market price risk when the various brokers enter the market at the same time.

Slice the order; the investor trades patiently and does not convey his full order at the start. The trade itself does not have a huge impact on the market, but there is a time lag between the decision to buy or sell and the implementation of the decision, which might be a risk the investor does not want to take.

Use Instinet or another continuous order matching system; when the investor enters his order in the Instinet screen based trading system, the order is visible to other traders, but anonymously displayed. The transparency of the system does not really facilitate large orders. The average order was around 1700 shares and its median trade is just 1000 shares.

Use Posit, AZX or the Crossing Network; Posit, Reuters Crossing Network, and the Arizona Stock Exchange (AZX) offer crossing sessions in which buy and sell orders are executed at mid prices or at the day's closing price. The investor saves spread and market impact costs, but the fill rates are low (less than 5 percent of shares submitted are crossed.

Use OptiMark; the investor can enter his trading profile (price, quantity and satisfaction weight)). This trading profile can be composed any way the investor wants. OptiMark will execute transactions based on mutual satisfaction following the trading profiles. Trades with a higher mutual satisfaction level will be executed first and this will result in lower trading costs.

The OptiMark system can be regarded as a 'crossing system' with a unique functionality: the satisfaction weight as described above. Although the OptiMark case demonstrates the strategic potential of the OptiMark system, its success is not guaranteed. The liquidity problem might be solved by using the OptiMark system, but critical mass, cost advantages, perception and reaction by other trading options (like traditional exchanges) and traders perceptions are crucial.

October 1997 Nasdaq, one of the stakeholders in the sector, decided to add a so-called limit-order file to the quote driven market that used to be a major characteristic of the Nasdaq market. There is, however, a lot of scepticism against the proposed plan, because it advocates a shift away from a dealer market. By allowing institutional investors to enter their trades directly via a Nasdaq terminal, the traditional market making function would no longer be required. By early January 1998, Nasdaq has decided to facilitate a link between OptiMark and the Nasdaq Electronic Communications Networks and the Nasdaq limit-order file it plans to build.

5.3 Retail Trading: Case OneSource

The globalisation trend in the financial sector has been accelerated by the rise of Internet technology. In the US industry more and more retail clients execute transactions through Internet [1,31]. The introduction of OneSource by Charles Schwab in 1996 has had a tremendous effect. Schwab, being a distributor of mutual funds of other fund management companies, has about US$ 450 billion (may 1998) in assets under management, of which US$ 115 billion is traded through Internet. Schwab has about 4.8 million active accounts, of which about 1,5 million are active on-line through Internet. The number of trades is about 105,000 a day, which is around 55% of total transactions by Schwab, compared to around 5,000 a day some 5 years ago. Schwab is now confronted with discount brokers and organisations like E-trade, Suretrade, and Ameritrade who offer transactions traded through Internet for about US$ 8 per trade. A trade via touch phone costs around US$ 30, a trade via Schwab around US$ 75. A trade through a full service broker, like Merrill Lynch costs up to US$ 250. These prices are not fully comparable because the US$ 8 is limited to transactions under 10,000 USD.

These price developments have lead to a segmentation of clients that are just interested in trading and clients that seek advice. Internet is not only used as a means for trading, but also to provide for all the information the client might need. One of the success factors for Schwab's OneSource is the quality of Schwab in selecting those mutual funds that suit the quality standards of Schwab. Trust in Schwab is very important in the success of Schwab's OneSource electronic fund supermarket.

5.4 Securities settlement: Case Robeco

This case study deals with the Robeco Group, one of Europe’s largest asset management organisations, managing around US$ 90 billion of assets. In managing mutual funds, the Robeco Group executes hundreds of thousands financial securities transactions all over the world. Until about 1994, the entire transaction process was mainly paper based. Both internal transaction information and settlement instructions were created manually and send to the receiving organisation by regular mail. This situation existed about 10 years ago and is shown as the 'basic form' in appendix 1.

Each 'square' in the graphs of appendix 1 indicates a process (or activity) in the security transaction life cycle, executed by one of the stakeholders (indicated on the vertical axe). Stakeholders are denoted with A through G. The horizontal axe is the time axe indicating the number of days needed to complete a transaction. For instance, the transaction process in the basic form starts with one activity by stakeholder C, followed by one activity of B, followed by one activity of A, followed by two parallel activities of B and C, followed by 5 subsequent activities of stakeholder D, etc. Thus, figure 5 shows the structure and relations in intra- and inter-organisational processes related to a security transaction.

To keep up with actual market requirements, Robeco Group decided to re-engineer its processes. The model of Venkatraman described in section 2, can be used to describe several forms of IT enabled Business Transformation in the financial securities sector. Appendix 1 shows the basic form of the processes in a financial securities transaction (STLC) and six transformation forms. The process structures are based on the case description of the transaction process redesign efforts at the Robeco Group in close relation with industry experts at Thomson Financial Services, SWIFT and other stakeholders [3,40], but are believed to be applicable to many organisations operating in the financial sector.

The following six forms of IT enabled business transformation have been identified in the figure above.

1. Localised Exploitation. Some of the processes are supported by local information systems; spreadsheets used to generate, for instance transaction sheets or settlement instructions to be printed in a standard format. The information systems are not linked to other systems n the organisation or to information systems in other organisations.

2. Internal Integration. Based on the previous step, Internal Integration links several local applications to enable a more integrated support by Information Systems of (parts of) the internal processes. An example of this situations is the use of a database in which a broker code corresponds to a total set of settlement instructions that are no longer derived from paper sheets but are automatically retrieved from the database based on the broker code and currency code of the transaction. Here, the transaction information system is linked to the settlement instruction information system.

3. Business Process Redesign. By linking local applications, redesign opportunities are generated and organisations following redesign principles [32,33] build an internally integrated information system supporting the entire internal processes. At the Robeco Group this has resulted in a newly built information system in which the trader enters the transaction details only once. Afterwards the data are used in automated processes in other departments to generate settlement instructions. Data are also used in processes that cross the organisational boundaries (phase 5). Some control processes or checks are no longer necessary because the controls are carried out by the system (risk controls) or have become obsolete (no more re-keying).

4. Business Network Integration. The business process redesign phase can include processes that involve other organisations (stakeholders). The STLC processes typically include other organisations and business process redesign in the financial sector can only be effective when these organisations are involved in the redesign efforts. At the Robeco Group, this phase involved changing the way transaction confirmations were received (switch from fax/telex to Electronic Trade Confirmation Systems) and the way settlement instructions were send (switch from fax/telex to SWIFT). Sending instructions electronically by mid 1996 reduced the error rate with 25% because less errors occurred because the receiving organisation did not need to re-key the settlement information into their own system. Next to this, the costs of processing of settlement instructions was reduced from around 60 to around 35 US$ [3].

5. Business Network Redesign. In the financial securities sector, the business network redesign phase includes the straight through processing concept. This concept focuses on achieving the process throughput without manual intervention. As soon as an error occurs, the process is stopped because the error needs to be investigated. Involving the process characteristics of the receiving organisations in the process of generating settlement instructions improves the straight through processing rate. This has resulted in the costs of settlement instructions to be further reduced to around 20 US$ [3].

6. Business Scope Redefinition. Integration of parallel value chains is perhaps the most difficult phase to achieve. On the other hand, dis-intermediation can be seen as an example of this phase.

The Robeco Group case is a practical example of what might be achieved in applying the business process redesign theories in a POEM. Business process redesign has been essential in Robeco to achieving a growth between 1994 and 1998 from about US4 25 billion to 85 billion in assets under management, from about 100,000 to 500,000 transactions a year, and from 500 to 1500 accounts.

6. Case analysis

The two trading cases (Optimark and Schwab's OneSource) show that price (and related quantity) and information provisions are important characteristics in

financial securities transaction oriented electronic markets.

The Optimark system offers a new dimension to institutional investors that are confronted with large transactions and face the problem of influencing the price of the securities. The success of Optimark depends on achieving critical mass, which up to now has been difficult because the incentives of different stakeholders are not similar (market makers will lose their profits).

The success of OneSource of Schwab is partly due to the fact that the SEC does not allow suppliers of mutual funds in the USA to distribute mutual funds directly to retail clients. Schwab has been able to leverage this entry barrier by successfully creating the transaction service via the Internet. The suppliers of mutual funds pay Schwab for selling their products and they benefit from the initiative by Schwab because they are dependent on the selling power of Schwab. The satisfaction of the client stems from accessibility to up-to-date information and easy access to trading in mutual funds. The difference between Schwab's OneSource and discount Internet brokers like E-trade, Ameritrade and Suretrade is client segmentation. Clients of Schwab are not only interested in obtaining the best price, but also value the advice. Assumption 1 is supported by the trading cases.

The settlement case (Robeco) shows that business process redesign has become a competitive necessity in managing growth. Considering the growth in the number of transactions, it would have been impossible to still work with the same processes; checking an average number of 300 transactions a day is totally different from checking 1500 transactions a day. The same holds for the settlement instructions. The case can be seen as an example of growth towards an electronic hierarchy, because the organisations (stakeholders) that are part of the securities transaction life cycle offer a specific service to the Robeco Group, leading to virtual integration of the organisations when the 'straight through processing concept' works. The stakeholders also have a longer-term relationship with each other. However, because of the developments in IT, increasing standardisation in settlement instructions and competitive pricing, it has become easier to switch from one custodian to another. The straight through processing concept is crucial in this respect, because changing to another custodian would involve starting the process of straight through processing all over again.

Another observation is that although the numbers of transactions have increased, the number of custodians did not change. This is due to the use of IT and reduced the risk perception. High-risk perception would lead to more custodians to spread the risks. The business network redesign phase might result in a situation in which custodians can be changed easily, which enables a shift towards electronic markets from the current electronic hierarchy (this shift has been advocated by Thomson Financial Services as well as by SWIFT).

The Business Network Integration level can be seen as a separate level in between Business Process Redesign (BPR) and Business Network Redesign (BNR), but it can also be seen as part of either BPR or BNR. Assumptions 1 and 2 are supported by the securities settlement case.

A specific element in the discussion on the development of electronic markets in the financial sector is that third parties, like TFS and SWIFT, have been working towards the introduction of electronic markets. It must be realised that SWIFT is an organisation that has been created by co-operation between the majority of banking organisations, enabling the acceptation by stakeholders who are mainly banking organisations.

7. Conclusion

The aim in this paper is to determine the impact of market network design on the process performance of inter-organisational systems in the financial securities sector. A distinction has been made between transaction oriented (TOEM) and processing oriented electronic markets (POEM), which are believed to have different characteristics and aspects determining their success. Optimark and Onesource are examples of TOEM, Robeco is an example of POEM.

Convergent incentives of stakeholders positively influence process performance and market performance. Previous research has shown that this is true for TOEM (16, 20, 29). This paper shows that this is also true for POEM.

Relations between exogenous factors (such as market network design) endogenous factors and process performance were examined. It was found that the design of TOEMS differs from POEMs. The complexities of the processes in financial industry, the high number and different interests of stakeholders involved were expected to negatively influence the development of electronic markets. However, the trading and securities settlement cases show that a complex electronic market can be successful if it has an open structure for many participants. It is crucial that key stakeholders support the development of an electronic market and convergent incentives are important in successfully introducing electronic markets.

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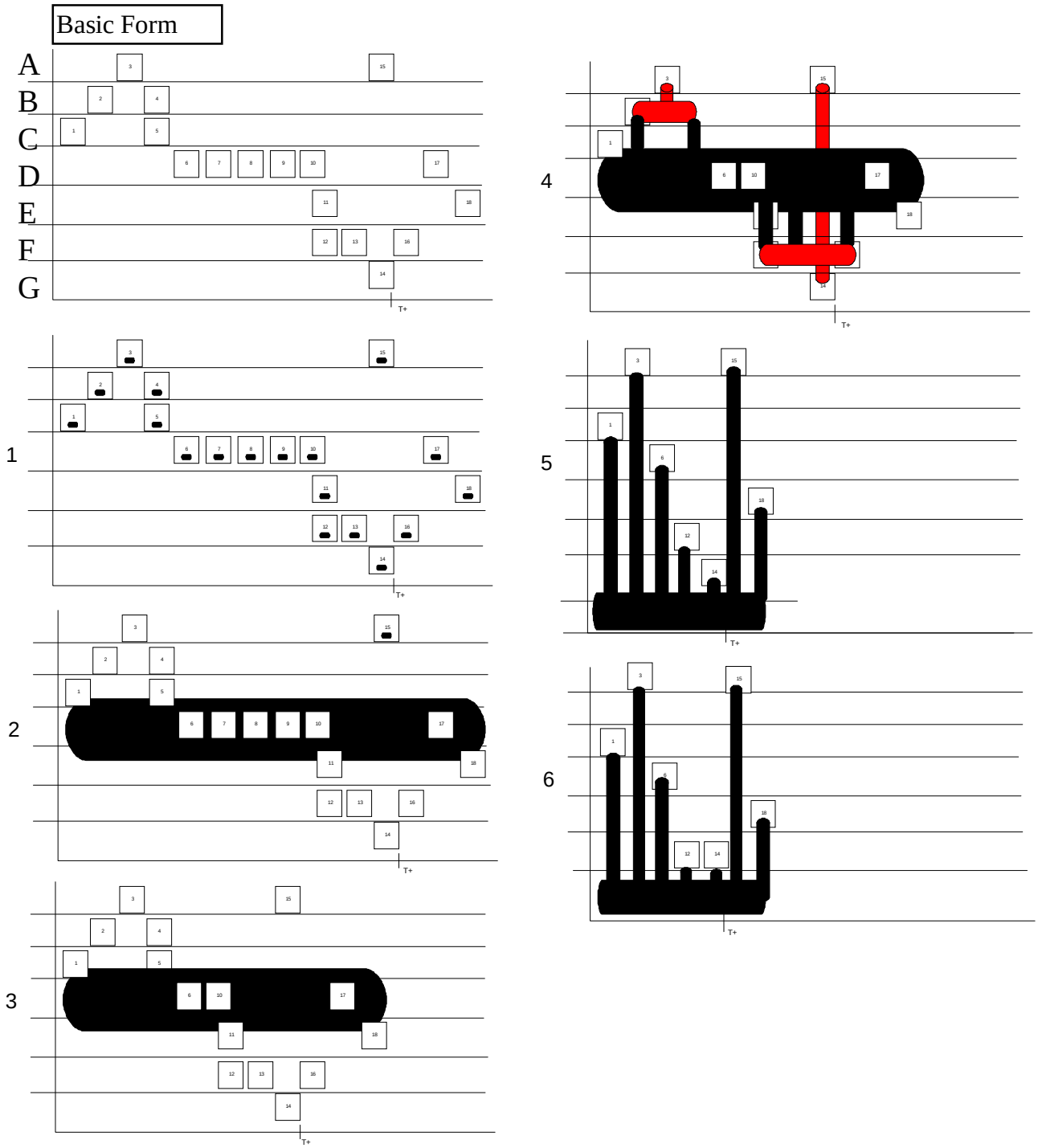

Appendix 1. Basic form of the STLC and six redesigned forms of IT enabled business transformation in the financial securities sector (for explanations see text).